

# SC112: EQUATIONS, CONSTANTS, AND CONVERSION FACTORS

8 Jan 2021

$N_A = 6.02214 \times 10^{23} \text{ mol}^{-1}$ $R = 0.08206 \text{ (L}\cdot\text{atm)} / (\text{mol}\cdot\text{K}) = 8.314 \text{ J} / (\text{mol}\cdot\text{K})$ $c = 2.9979 \times 10^8 \text{ m/s}$ $F = 9.65 \times 10^4 \text{ C/mol} = 9.65 \times 10^4 \text{ J} / (\text{V}\cdot\text{mol})$ $K_w = 1.00 \times 10^{-14} \text{ at } 25^\circ\text{C}$ $1 \text{ atm} = 760 \text{ torr} = 760 \text{ mm Hg}$																<table border="1"> <tr><td>1</td><td>2</td></tr> <tr><td>H 1.00794</td><td>He 4.002602</td></tr> </table>		1	2	H 1.00794	He 4.002602																																																																																																																																													
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1.  $\Pi = iMRT$

2.  $\Delta T_f = K_f i m$

3.  $\Delta T_b = K_b i m$

4.  $C_{gas} = k_H \cdot P_{gas}$

5.  $P_{solution} = x_{solvent} \cdot P_{solvent}^o$

6.  $\Delta S_{univ} = \Delta S_{sys} + \Delta S_{surr}$

7.  $\Delta S = \frac{q_{rev}}{T}$

8.  $\Delta S_{rxn}^o = \sum nS^o (\text{products}) - \sum nS^o (\text{reactants})$

9.  $\Delta G_{rxn}^o = \Delta H_{rxn}^o - T\Delta S_{rxn}^o$

10.  $\Delta E = q + w$

11.  $\Delta G_{rxn} = \Delta G_{rxn}^o + RT \ln Q$

12.  $\Delta G_{rxn}^o = -RT \ln K$

13.  $[X]_t = -kt + [X]_0$  (zero order)

14.  $\ln[X]_t = -kt + \ln[X]_0$  (first order)

15.  $\frac{1}{[X]_t} = kt + \frac{1}{[X]_0}$  (second order)

16.  $t_{1/2} = \frac{0.693}{k}$  (first order)

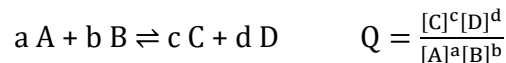
17.  $t_{1/2} = \frac{1}{k[X]_0}$  (second order)

18.  $k = Ae^{-E_a/RT}$

19.  $\ln(k) = -\frac{E_a}{R} \left(\frac{1}{T}\right) + \ln(A)$

20.  $\ln\left(\frac{k_2}{k_1}\right) = -\frac{E_a}{R} \left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

21. For a generalized reaction:



22.  $K_w = [H_3O^+][OH^-]$

23.  $\text{pH} = -\log[H_3O^+]$

24.  $K_w = K_a K_b$

25.  $\text{pH} = \text{p}K_a + \log \frac{[\text{base}]}{[\text{acid}]}$

26.  $\ln K_p = -\frac{\Delta H_{rxn}^o}{R} \left(\frac{1}{T}\right) + \frac{\Delta S_{rxn}^o}{R}$

27.  $\Delta G_{cell}^o = -nFE_{cell}^o$

28.  $E_{cell} = E_{cell}^o - \frac{0.0592}{n} \log Q$

29.  $E_{cell} = E_{cell}^o - \frac{RT}{nF} \ln Q$